

High-Tech made in Germany

The first meeting of the German IEEE IAS/PELS/IES chapter in 2006 was held at Lust Antriebstechnik GmbH in Wetzlar/Lahnau on March, 30 - 31.



The afternoon of 30th of March started with a guided tour through the city of Wetzlar. Wetzlar has about 50000 inhabitants and is a center of fine-mechanics and optics industry in Germany. Companies like Leica systems, Buderus and Hensoldt have their headquarters here. The participants walked around the nice old downtown of Wetzlar with its old houses made of timbered framework and the cathedral used by lutherans and catholics simultaneously. Also Wetzlar is one of the towns where Germany's best known poet Johann Wolfgang von Goethe resided for some years. During his stay in Wetzlar Goethe got the inspiration for his famous novel "Die Leiden des jungen Werthers".

After the guided tour Prof. Andreas Lindemann, chapter chair, opened the IEEE Business session of the meeting in the conference center of Wetzlar. Among others he gave a short review of the chapters activities and publications in 2005. Prof. Wilfried Hofmann announced the next chapter meeting to be held in May 2006 at the Technical University of Chemnitz.

Subsequently all attendees of the meeting were invited by Lust Antriebstechnik GmbH to enjoy the outstanding skating show "Peter Pan on Ice" performed by members of Holiday on Ice. After the show dinner was served. The opportunity to meet colleagues and discuss all kinds of technical and further topics in a comfortable atmosphere was highly appreciated by the participants.

The second day, March 31st, the auditory was welcomed by Mr. Karl-Heinz Lust, the founder of Lust Antriebstechnik GmbH. Lust Antriebstechnik GmbH was founded in 1971. In that times the company produced electrical drives for vacuum pumps, especially frequency converter directly fed by the electric grid. Nowadays Lust Antriebstechnik produces servo drives and high speed drives. In 1993 the company started a new business namely the hybrid technology for microsystems. In 1998 a new company within the Lust Antriebstechnik group named Levitec was founded. This company's speciality is the electromagnetic bearing technology. In 1999 and 2002 the companies Sensitec and Lust DriveTronics were founded. Sensitec produces magneto-resistive components and sensors, which have even been used by NASA for its mission to Mars. In 2004 Naomi Technologies was founded by Mr. Karl-Heinz Lust. This company is active in the field of AMR and GMR technology.

After this introduction to the Lust Group, Dr. Stephan Beineke of Lust Antriebstechnik presented applications of direct-driven systems with linear permanent magnet motors. He gave an overview about five different control methods for current commutation, the application of a speed observer to extract the speed signal and a correction algorithm for the encoder signals.

Subsequently Dr. Andreas Bunte of Lust DriveTronics introduced the technologies used for the pitch systems of sea flow turbines. These concepts use the kinetic energy of the sea flow to generate electrical power. The flow speed could be as high as 45 m/s. Dr. Bunte introduced the projects of SEAFLOW and SEAGEN. These two systems each generate 300 kW with a rotor diameter of 11 m. The

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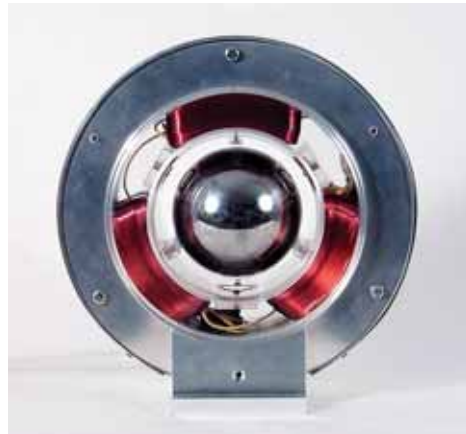
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shaft of these systems is located 15 m under the sea. The latest projects in the area of renewable energy from sea flow and sea waves are PELAMIS with 500 kW and Wave-Dragon with 600 kW. Lust DriveTronics has also experience in the area of electric pitch systems for wind turbines.

Next Dr. Christian Redemann of Levitec GmbH, also a company of Lust Group, reported about high-speed drives with active magnetic bearings. He explained the different types of active magnetic bearings especially a combined radial-axial magnetic bearing. These magnetic bearings use a hybrid excitation. The basic magnetic excitation is realized by NdFeB permanent magnets. Deviations from the desired air-gaps are controlled by small excitation coils. Another speciality is the integration of magnetic bearings in stators of three phase permanent magnet synchronous machines. These high-speed electrical machines have a maximum speed of 100.000 rpm with two pole pairs. The PWM frequency is about 64 kHz. The radial forces of the magnetic bearing take values up to 2000 N.

The last presentation was given by Joachim Achenbach of Sensitec GmbH and Dr. Jan Marien of Naomi Technologies, both belonging also to the Lust group, about the applications of XMR sensors. Mr. Achenbach gave an introduction about the



Levitec's magnetic bearing holding an iron ball.

magneto-resistive effect which was discovered by Kelvin in the 19th century. XMR sensors use the variation of the electrical resistance in the presence of magnetic fields. The deviation from nominal resistance is about three percent when using anisotropic materials. Applications of XMR sensors are high current sensors ranging from 200 A to 2000 A for use in hybrid automotive vehicles and low cost position encoders used in electrical drives.

Dr. Jan Marien reported about the different magneto-resistive effects namely Anisotropic MR (AMR) and Giant MR (GMR) and their production with micro-lithographic methods.

He presented different applications in the area of medical systems to measure the magneto-cardiogram at 0.1 pT and the magneto-encephalogram at about 1 fT. Other applications are found in the area of magnetostatic printing devices to replace the standard blanket cylinder used in printing machines.

After the technically exciting presentations all participants were invited to a guided factory tour of Lust Antriebstechnik viewing the production of control units for electrical drives and magnetic bearings as explained before. In summary, the event, generously hosted by a highly innovative private company, was a great success, which has been underlined by the high number of some 70 participants: The manifold program comprised technical presentations and a technical tour focused on the area of activities of the chapter, further an outstanding social meeting and a session dedicated to IEEE Business. The chapter would like to cordially express its gratitude to the hosts.

For further information about the IEEE IAS/PELS/IES German Chapter and the next meetings please visit our homepage at <http://www.ewh.ieee.org/r8/germany/ias-pels>

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Welcome speech of Karl-Heinz Lust, founder of Lust Antriebstechnik GmbH.



"PELS president Prof. Rik De Doncker (second from left), RWTH Aachen, listen to the explanations of Dr. Josef Wiesing (first from left), head of R&D at Lust Antriebstechnik GmbH."